

EEL4712 Digital Design
Department of Electrical and Computer Engineering
University of Florida

Spring Semester 2019

Catalog Description: *Prereq: EEL3701.* Advanced modular logic, design languages, finite state machines and binary logic.

Credit Hours: 4

Prerequisites by Topic: Fundamentals of combinational and sequential digital logic.

Course Objectives: Students will gain fundamental knowledge and understanding of principles and practice in digital design through class lectures, reading assignments, and lab experiments using VHDL and field-programmable gate arrays.

Contribution of course to meeting the professional component (ABET): 4 hours of Engineering Design

Relationship of course to program outcomes (ABET): EE2, a, c, e, k

Instructor(s): Dr. Stitt (323 Benton, gstitt@ece.ufl.edu, www.gstitt.ece.ufl.edu)

Office Hours: Monday Period 3, Tuesday Period 3, or by appointment. Subject to change.

Teaching Assistants:

Thomas Hanes (thanes@ufl.edu, Sections: 12218, 12220, Office Hours: T 4-5, NEB211)

Samantha Soto (ssoto65@ufl.edu, Sections: 12185, 12186, Office Hours: TBD, NEB211)

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Carlos Matos (carlosm04@ufl.edu, Sections: 12154, 12217, Office Hours: T 8, W 8, NEB211)

Meeting time and location: Period 2, M W F (8:30am – 9:20am), MCCA G186

Laboratory schedule (NEB 0213B):

M | Period 9 - 10 (4:05 PM - 6:00 PM) Class Number: 12153

M | Period 11 - E1 (6:15 PM - 8:10 PM) Class Number: 12154

M | Period E2 - E3 (8:20 PM - 10:10 PM) Class Number: 12155

T | Period 9 - 10 (4:05 PM - 6:00 PM) Class Number: 12183

T | Period E2 - E3 (8:20 PM - 10:10 PM) Class Number: 12184

W | Period 9 - 10 (4:05 PM - 6:00 PM) Class Number: 12185

R | Period 7 - 8 (1:55 PM - 3:50 PM) Class Number: 12186

F | Period 3 - 4 (9:35 AM - 11:30 AM) Class Number: 12187

W | Period 7 - 8 (1:55 PM - 3:50 PM) Class Number: 12188

W | Period 11 - E1 (6:15 PM - 8:10 PM) Class Number: 12189

F | Period 7 - 8 (1:55 PM - 3:50 PM) Class Number: 12190

R | Period 9 - 10 (4:05 PM - 6:00 PM) Class Number: 12217

R | Period 11 - E1 (6:15 PM - 8:10 PM) Class Number: 12218

R | Period E2 - E3 (8:20 PM - 10:10 PM) Class Number: 12219

F | Period 9 - 10 (4:05 PM - 6:00 PM) Class Number: 12220

Required Textbook(s):

- Brown, S. D. and Vranesic, Z. G., "Fundamentals of Digital Logic with VHDL Design", Second or Third Edition, McGraw-Hill

Course Outline: The following is an overview of the topics to be covered.

I. Digital design building blocks and technologies

- Review of commonly-used digital components: MUXes, deMUXes, decoders, encoders, adders, flip-flops, counters, registers, etc. In addition, we will learn to specify these components in VHDL.
- Carry-look-ahead adders, ALUs, multipliers
- Programmable logic devices: PAL's, PLA's, PROM's, CPLD's, and FPGA's
- Memories - RAM, dRAM, and ROM

II. Digital design methodology and techniques for finite state machines (FSM) and FGPA's

- Top-down, modular design
- Controller/controlled-component architecture
- ASM fundamentals and design methods
- Implementation methods - traditional, MUX, ROM, "one-hot"
- Design and Implementation techniques using FPGA's
- Testing and design for testing
- Digital design Examples (labs)

III. Design environments and tools (lab-intensive)

- Design life cycle using model digital development environments
- Design specification: graphical, VHDL
- Logic synthesis
- Simulation: functional and timing
- Timing analysis
- Device program
- Testing

Lab Experiments: A series of laboratory experiments will be assigned in synchronization with the topics covered in class lecture. Labs will involve pre-lab work that must be completed before the assigned lab time.

Equipment:

- An FPGA-based laboratory board (will be provided to you)
- Digilent Analog Discovery (must be purchased):
<http://www.digilentinc.com/Products/Detail.cfm?Prod=ANALOG-DISCOVERY>

Attendance: highly recommended.

Grading:

- Midterm1: 20% (Friday, Feb 15, in class)
- Midterm2: 20% (Friday, March 22, in class)
- Midterm3: 20% (Friday, Wed April 24, in class)
- Labs/Homework: 40%

Grading Scale: Final grade to be determined by curved average of exams and labs.

Make-up Exam Policy: Missed exams cannot be made up, except in case of documented medical emergency.

Honesty Policy: All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

Accommodation for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

UF Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.